THE PREVALENCE AND CHARACTER OF TUBERCULOSIS IN HONGKONG

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III. THE MORBID ANATOMY AS MET WITH IN CASES AMONG CHILDREN

It is a well-known fact that the primary portal of entry of the bacilli in cases of tuberculosis and the mode of spread of the disease are by no means always easy to determine: in some instances, indeed, one can hardly do more than hazard a conjecture. When we remember that the bacilli may pass through a mucous membrane and even through the walls of vessels and circulate as foreign bodies without setting up any immediate injury, but only more remotely causing changes at some distant site where they finally settle, we must always be cautious against employing too freely the anatomical distribution of the lesions as found in the post-mortem room for the interpretation of their genetic relations. In some instances, again, none of the ordinarily described routes seem to explain the method of spread, as was indicated in some of those mentioned in a previous paper.

The extent and distribution of tuberculous lesions in an animal inoculated experimentally depend upon several factors, namely, the number and virulence of the bacilli, the resistance set up against infection by the inoculated animal, the seat of inoculation, and the time which has elapsed since infection. It was found as a result of several experiments in which the same dose of bacilli from the same source was inoculated at the same site (namely, subcutaneously into the left hind leg) into animals of the same species and as nearly as possible of the same weight, that in ten days the adjacent gland was involved; in ten to twenty days the left superficial and deep

inguinal and the sacro-lumbar glands, and also, perhaps, the spleen and the retro-hepatic glands. In another ten to fifteen days the liver, the lungs, the bronchial, suprascapular, and cervical glands on both sides showed involvement (Delépine).

Since in my series the respiratory portal of entry was that most frequently encountered, these cases will first be dealt with.

Albrecht, Ghon, and others hold that there is a special form of tuberculosis in children, consisting of a primary lung focus and resulting from the entrance of the bacilli by inhalation. This focus, they stated, was usually the size of a pea, but might be quite small and was rarely larger than a cherry. In nearly three-fourths of the cases the focus was single. The focus is believed to arise 'in aggregations of lymphoid tissue in the neighbourhood of small bronchi.' Around this focus small tubercles are seen, and perhaps reactionary fibrous tissue. In the case of larger foci, hard, dry caseation is usual, and occasionally there is actual cavitation. As regards the situation of the focus, the order of frequency was: right upper, left upper, right lower, left lower, right middle, the first-named site being four times as common as the last.

An examination of the mediastinal glands showing involvement will, in many cases, enable one to predict the situation of the lung focus. The lymphatics, deep and superficial, discharge into the broncho-pulmonary glands situated between the branches of the main bronchi and at the hilus; those from the middle and lower portions of the lung into the inferior tracheo-bronchial at the bifurcation of the trachea; those from the upper into the superior tracheo-bronchial in the angle between the trachea and bronchus. There is also a chain of glands each side of the trachea, the para-tracheal glands. Infection across from one side to the other is frequently met with.

The original focus may open into a bronchus, and thus by inhalation a tuberculous broncho-pneumonia is set up; a like result would, of course, follow the perforation of a bronchus by an inherent gland. Again, there may be direct extension from a gland adherent to the pulmonary tissue, while, lastly, by communicating with a blood-vessel, miliary tuberculosis may ensue.

It used to be held that gland infection was primary and the lung condition secondary to it, but this would leave unexplained the

fact of apparently arbitrary selection of a site remote from the primary gland infection, while the intermediate tissue remained free from disease.

Canti examined the bodies of eighty-four children under ten years of age. Of these, there were thirty-three under one year, and sixteen (19·05 per cent.) showed tuberculous lesions. Of these sixteen, ten had foci in the lungs, the largest was the size of a cherry, the average that of a pea. In eight a single focus only was found; in one case two foci of practically the same age were seen, and one showed several; in this instance, however, one of the foci was cavernous and appeared older than the remainder. In the eight with a single focus, this was found three times in the left lower lobe, twice in the right upper, twice in the left upper, and once in the right middle. In other words, the findings in this series of Canti's agreed in the main with those of Ghon as affording evidence in favour of the common existence of pulmonary tuberculosis in children. The chief points to which attention is directed are the following, and, in discussing the series of cases considered here, I do not think one can improve upon the lines taken by Canti, and for purposes of comparison it is advisable to deal with the points in this order:—

1. The almost constant finding of a lung focus when tuberculous mediastinal glands are present, and the close relation of these glands to the lung focus.
2. The frequent singleness of the lung focus.
3. The constant finding of tuberculous mediastinal glands when a lung focus is present—a corollary of the first.
4. The almost constant absence of a lung focus when the portal of entry appears to be elsewhere.
5. The almost constant absence of evidence that the portal of entry may be elsewhere when a lung focus is present—a corollary of the last.

Work at the mortuary here has afforded me exceptional opportunities for studying these questions, the number of bodies to be examined is great, the proportion of children very high, and a few weeks' experience sufficed to drive home the fact that tuberculosis forms a large percentage of the causes of death.

The differences between the post-mortem findings in children

dying from tuberculosis and those in adults are considerable. Amongst the first three hundred consecutive cases with which this and the two previous papers are concerned there were two hundred and twenty-five under ten years of age. The remaining seventy-five are insufficient for a study of adult tuberculosis, so this paper will be restricted to dealing with the disease as it occurs in children here. The number (two hundred and twenty-five cases) will provide sufficient basis for argument as to whether the conditions of tuberculosis in the tropics, as exemplified at least in Hongkong, resemble those at home, and, if not, in what the differences consist. For purposes of discussion, it will be well to take the points in the above order.

1. *The almost constant finding of a lung focus when tuberculous mediastinal glands are present, and the close relation of these glands to the lung focus.*

The truth of this statement has been substantiated in the majority of the present series. In twenty-nine instances, however, caseous mediastinal glands were found without any focus being detected in the lungs. Eleven of these showed strong evidence of being primarily alimentary and the mediastinal glands may have become involved secondarily to the mesenteric, a condition the occurrence of which was proved by the experimental work of Calmette, Guérin and Breton (1907). They found that in guinea-pigs dying in two to four weeks after being fed on the bacilli the mesenteric glands (especially the superior deriving from the small intestine) were enlarged and inflamed, although no trace of any intestinal lesion could be determined. After six to seven weeks, these glands were caseous in greater or less degree and the lungs showed involvement by miliary tubercles with affection of the corresponding tracheo-bronchial glands. Furthermore, these glands, as shown in several of the cases detailed in this series, become caseous more rapidly than the pulmonary lesions preceding their involvement.

In one other of my series there was a tuberculous abscess of the sixth cervical vertebra discharging into the right pleural cavity, which might account for the involvement of the mediastinal glands without a focus in the lung. Putting these aside, there were still seventeen which did not conform to the statement relative to the

presence of a lung focus when mediastinal glands are found and the relation of the glands to the focus. Of these seventeen, there were fifteen which showed miliary tubercles in the lungs, occasionally in considerable numbers, but in twelve only a few; nevertheless, mediastinal glands on one or both sides were found enlarged and caseated. In none of them was any sign of tuberculosis found in the tonsils or cervical glands. Where the involvement of the lung with miliary tubercles is fairly extensive, it may be argued that the gland constituted the focus whence the lung became infected, but then we are still in the dark as to the source whence it became itself tuberculous.

Apropos of some of these cases, the remarks of Bushnell in the *Military Surgeon* (1918) may be recalled. He states that from a hilus infection the tubercle bacillus is described as travelling by the peribronchial lymph spaces in a direction opposite to that of the normal lymph flow to a region in the upper lobes where the lymph motion is most sluggish. This might be aided by a reversal of the lymph current, and such a reversal might in turn occur as the result of a block at the hilus. The tubercle bacilli travelling by these spaces to the parenchyma are resisted by the tissue cells and a type of peribronchial tuberculosis results. Caseation through the bronchus may take place, although peribronchial tuberculosis is more often of the 'closed' type, as is evidenced clinically by the frequency with which the bacilli are found in the sputum and the rarity of haemorrhages in such cases.

In two others the difficulty is increased by the fact that although the mediastinal glands were enlarged and caseous, in one case the tracheo-bronchial, in the other the paratracheal, forming adherent and caseous masses, there was no involvement of the lungs at all. In the former there were meningeal tubercles mostly at the base and along the sylvian fissures, whereas in the latter the only organs found affected were the kidneys, where at the base of a pyramid towards the lower pole of each were several minute tubercles focally arranged.

So much for instances in which caseated mediastinal glands were found without a corresponding focus in the lung. As regards the second point—the close relation of the affected glands to the lung focus—there were four cases in which the two did not

correspond, in other words, the expectation of localising the lung focus from the gland involved was falsified. In three the focus was in the left lung, as large as a haricot bean, and in one case there was a cavity as large as a filbert; in the fourth the focus was in the right lung. In each case there was a caseated gland, but on the opposite side. The related glands on the affected side were, in three, not involved at all, and in the fourth there was a little congestion only.

It is well known that communication between the glands from one side to the other may be free, and this may be offered as an explanation of the passage of infection from one side to the other; nevertheless, it is less likely that in children, in whom caseation of the mediastinal glands occurs early and readily, infection should pass to the opposite side and apparently miss those on the side affected. One example may be quoted briefly:—In a boy, three years of age, there was a sub-apical focus as large as a pea in the right lung and a few scattered miliary tubercles in both; the hilus glands were enlarged on both sides, but whereas on the right they showed merely a small caseous point on section, on the left the gland was completely caseated. This differs from the four previously mentioned in that there was a spot of caseation in the gland on the side of the focus, whereas in the others the related glands had apparently escaped altogether.

2. *The frequent singleness of the lung focus.*

Among the sixteen cases described by Canti there were eight with a single focus, while Ghon states that in 72·35 per cent. this is the case. Of the two hundred and twenty-five children under ten years of age among my series of three hundred cases, there were one hundred and thirty-seven showing focal conditions in the lungs. Of these, there were ninety-five in which the focus was single, *i.e.*, in 69·34 per cent.; in forty-two, or 30·66 per cent., there was more than one.

Ghon found that when only one lung focus was discovered the various lobes were involved in the following order of frequency:—Right upper 30·98 per cent., left upper 23·24 per cent., right lower 22·54 per cent., left lower 15·49 per cent., and right middle 7·75 per cent.

Of the ninety-five cases in my series in which only a single focus was found, the numbers in which each lobe was concerned were:—Right upper twenty-six, or 27·37 per cent.; right lower twenty-three, or 24·21 per cent.; left upper eighteen, or 18·95 per cent.; left lower fifteen, or 15·79 per cent.; right middle thirteen, or 13·68 per cent. The main differences, it will be seen, are that in his series the left upper and right lower were affected in about an equal number of times, the former slightly preponderating, whereas in mine these were reversed, and, secondly, in mine the proportion in which the right middle lobe was involved was much higher.

As regards those which contained more than one focus, there were thirty-two with two, five with three, and the same number with several. The following was the distribution in cases with two foci:—

Both in the upper lobe of the left lung	5
Both in the lower lobe of the right lung	5
Both in the lower lobe of the left lung	4
Both in the upper lobe of the right lung	3
One each in the lowest and middle lobes of the right lung ...	4
One each in the upper and lower lobes of the left lung ...	4
One each in the upper and middle lobes of the right lung ...	2
One each in the upper and lowest lobes of the right lung ...	2
One each in the upper lobe of each lung	2
One each in the lower lobe of each lung	1

Of the five instances in which three foci were found, in one case all were in the upper lobe of the right lung; in another all were in the lower lobe of the left. Of the remaining three, all were in the right lung, viz., one in the upper and two in the lower in two cases, and the reverse of this, two in the upper and one in the lower in one.

Finally, in the five cases in which there were more than three foci, the following was the distribution:—All in the left lower lobe in one; in another, three foci were present in the upper lobe of the left and one in the upper of the right; in a third, foci were present in all lobes except the right upper; in a fourth, in all except the left upper; in the fifth, in all except the left lower.

Taking all the cases in which foci were found in the lungs, *i.e.*, in one hundred and thirty-seven instances, the right upper lobe

was involved forty-two times, the right lower forty-one, the left upper thirty-two, the left lower twenty-eight, and the right middle twenty-two. Thus, whereas Ghon found that the left upper was that most frequently involved after the right upper, in my series these were reversed; the right upper and right lower were involved almost an equal number of times, whether we consider merely cases with a single focus or whether we have regard to all instances in which focal lesions were present.

3. *The constant finding of tuberculous mediastinal glands where a lung focus was present.*

In adult cases this has certainly not been my experience here, but it appears to hold good with nearly all cases in children. In twelve of this series, in spite of focal affection of the lung, and even of considerable advancement of the disease, there was no naked-eye involvement of mediastinal glands. In four of these the glands showed microscopically giant cells and a few bacilli. In three others, owing to the early age at which death occurred (twenty-two, twenty-four and twenty-nine days, respectively), although foci were present and the disease was of considerable extent in the lungs, an explanation of the absence of tuberculous affection of the corresponding mediastinal glands may be tendered by suggesting that death took place before there was time for gland involvement to arise. This hypothesis finds a certain measure of support from two others, each of seven weeks old, in whom there was a lung focus and the corresponding mediastinal gland was congested and slightly swollen, not macroscopically tuberculous, but on sections being made giant cell systems and bacilli were seen. On the other hand, the findings in two others appear to deprive this hypothesis of its value. In one of these, a child of three years, there was typical phthisis—tuberculous broncho-pneumonia with ulceration—and in the other, four years of age, the disease had been in existence long enough to produce caries of three vertebrae in addition to a lung focus and several caseating tubercles; nevertheless, no corresponding gland involvement was found.

4. *The almost constant absence of a lung focus when the portal of entry appeared to be elsewhere.*

This is a more difficult matter on which to pass an opinion out here, where the chances of infection by a double route, respiratory and alimentary, are so great. In a previous paper, when we were discussing cases in which the primary portal was uncertain, several of such were dealt with. To take these as instances for consideration as to the verity of the dictum of this section would be to beg the question. The statement would apply rather to places where one sees either respiratory or alimentary cases, or at least cases in which the primary portal is undoubtedly one or the other, not those in which the dual route is not only possible, but, as in many here, highly probable.

Apart from these, there were five in which a definite lung focus was present, although the primary portal of entry was probably, in fact, one might say certainly, not via the respiratory tract. In two there was a condition of tabes mesenterica, the glands in the abdomen being in aggregated caseous masses; in one of these cases, an infant of eight months, there was a focus the size of a pea in the right lung; in the other, a child of twelve months, a focus as large as a marble, also in the right lung. In two others, aged twenty months and four years respectively, there was extensive tuberculous enteritis with numerous ulcers and caseated mesenteric glands, and in the second marked tuberculous peritonitis also; in each of these there was also a lung focus. In the fifth, a girl of four years, there was caries of three vertebrae, and several tuberculous ulcers were present in the intestine; in the lower lobe of the right lung was a focus as large as a cobnut.

It is a difficult matter to discuss this question apart from the next, namely:—

5. *The almost constant absence of evidence that the portal of entry might be elsewhere when a lung focus was present.*

In the previous points, my findings have been to a great extent in agreement, but in this, if I understand it correctly, my experience is distinctly at variance.

Several of the cases reported in this series would find an explanation in a dual route of infection, whereas the statement above

would appear to rule out such an occurrence, not merely as a more or less simultaneous infection, but even after an interval. So it would seem to put forward the claim that, given a primary lung focus due to respiratory route infection, there is little, if any, likelihood of the intestine becoming affected unless secondarily to the pulmonary focus. This cannot be ascribed to an increased resistance or immunity owing to the presence of the lung tuberculosis, because it is a well-established fact that intestinal tuberculosis can arise from the swallowing of infected sputum.

One explanation which, however, in my opinion, savours rather of evading the difficulty than explaining it, would be to say that whenever a lung focus is present together with definite alimentary tuberculosis, the former was the primary site, and the intestinal, though perhaps more advanced, arose from the swallowing of the infected sputum. We may account for some of the cases in this way: the respiratory route gives rise to the lung focus primarily, the intestine becomes infected secondarily, and the lungs are again involved by miliary tubercles spreading via the lymphatics to the thoracic duct, and so to the pulmonary circulation. A considerable number in this series may be thus explained, and several have been mentioned in the previous paper.

In connection, however, with these points—the 'almost constant absence of a lung focus when the portal of entry appears to be elsewhere,' and the corollary of this, the 'almost constant absence of evidence that the portal of entry might be elsewhere when a lung focus was present'—there are twelve which did not appear to conform. There is no need to describe them all; two examples will suffice:—(i) A girl of four years with tuberculous caries of the spine. In the discussion on this case, it was stated: 'The spinal site was probably the oldest; from the number of ulcers in the intestine, from the fact of the large and the small both being involved, and from the mesenteric glands being in large caseous masses, the alimentary tract would appear to have been involved prior to the lung.' There was a sub-apical focus in the right lung the size of a cobnut, becoming caseous. (ii) A female infant of eight months; the mesenteric glands were in large caseous masses, whereas the mediastinal were not much enlarged and contained merely small caseating points. The tuberculous infection of the lung

was limited to the middle lobe of the right, in which there was a distinct focus the size of a pea.

It has been stated by MacCallum that in children one may find, instead of the apical lesion so common in adults, a caseous softening of bronchial lymphatic glands and erosion through a bronchus to produce wholesale tuberculosis of a lung, or a large section of it. Several of the cases in this series might be looked upon as examples of this; we must bear in mind, however, that, though this may explain generalised infection of part or even the whole of a lung, we still leave unaccounted for the source whence the gland became involved. In those instances in which we find a focal lesion, the subsequent more generalised condition in that lung, or part of it, may be ascribed to reinfection from the gland, which itself was due to the primary focal lesion. In cases where no focal lesion is found to which the mediastinal gland could be traceable, and especially in cases where both lungs are attacked by miliary or grey tubercles, the spread may have occurred by the blood-stream; if general, by the pulmonary circulation, if localised, either by a branch of this or of a bronchial artery. In one case, in which there was caries of the right side of the sixth cervical vertebra and pus discharging into the right pleural cavity, into a loculus shut off by pleural adhesions, the glands at the hilus and along the trachea were caseous and may have arisen secondarily to the lesion above, and the widespread miliary affection of the right lung may then have resulted by the method which MacCallum describes.

Passing on to the question of abdominal and alimentary tuberculosis, there is not much to be said in this paper dealing with the aspect of the morbid anatomy. As already stated, cases of isolated primary tuberculosis of the intestines, not uncommon at home, are comparatively rarely met with out here. In only four instances was the disease confined to the abdomen; three of these were infants, aged respectively ten, eighteen and twenty-two months, the fourth was a child of seven years. From the intestines with, or more often without, any local lesion, the bacilli are arrested for a time in the mesenteric glands and thence spread either by way of the lymphatics to the blood and so to the lungs (of this, several instances have occurred in this series, and have already received sufficient mention), or else by the portal blood to the liver. This has been

very rare in these cases. In fact, cases in which the liver was extensively involved have been few. The spleen in nearly all was more affected than the liver, and in two only was the liver infected and not the spleen. When tubercles were found in the liver, in the large majority of instances they were small, miliary to pin-head, and confined to the surface. The rarer forms of intestinal tuberculosis where the disease is localised to the region of the ileo-caecal valve to produce a mass of tuberculous cicatricial tissue constricting the lumen, I have met with once among these cases.

The following is worthy of mention while dealing with alimentary forms. The subject was a child of two years; there were tuberculous ulcers in the small intestine, and the mesenteric glands were enlarged and caseated. A tuberculous meningitis was the only other lesion detected; there were numerous pin-head tubercles at the base and a few on the vertex. The mode of extension in this case is obscure. One only evades the question by saying that it was probably metastatic by way of the blood-stream, analogous possibly to cerebral abscess in cases of haemorrhoids and in liver conditions.

The meninges and brain were found involved in a considerable number of cases, particularly the former, and usually as miliary tuberculosis affecting mostly the base and the Sylvian fissures. Definite focal masses in the brain or cerebellum were comparatively rare.

There were several cases in which the lungs and meninges were the only parts in which tubercles were found. In seven instances the meninges and one lung only were affected; in six of these it was the right lung which was attacked. In one other case, in addition to the lung and meningeal involvement, there was a tuberculous focus the size of a small marble in the right cerebellar hemisphere. In one case, a girl of eight years, the mediastinal glands and the meninges were the only parts found affected, there being no tubercles, either focal or miliary, in the lungs.

The mode of extension to produce the peculiarly limited distribution of tubercles in lungs and meninges is obscure, and is, perhaps, analogous to brain affections secondary to other pulmonary conditions, bronchiectasis, for example. There is not, as far as I am aware, any lymphatic connection between the lungs and the base of the brain, and if the extension occurred by way of the

blood-stream, why should the secondary infection be so limited? One would almost certainly expect to find signs in other organs.

I am also unable to suggest any significance for the fact that, in the combination of lungs and meninges, of the seven cases in which one lung only was affected, in six it was the right; and of the five cases in which both were involved, in three the right was more affected than the left. Again, in the case already referred to in which the mediastinal glands and meninges were tuberculous, but in which no signs were detected in the lungs, the glands were those of the right side only.

The combination of lungs, meninges and spleen was a little more common, fifteen of such being met with. In two of them only one lung was involved, in each case the right.

In this connection, it may be worth noting that the involvement of the spleen with miliary tubercles as the only abdominal viscus affected has not been very infrequent, and may find explanation, perhaps, if one regards the spleen as the meeting point of lymphatic and blood terminals. I may refer here to the observations of Dumas upon what he calls an unusual form of tuberculosis met with in Salonica amongst Senegalese and Arab troops. He noted that the mediastinal and peribronchial lymphatic systems were first affected, and later the pleura and pericardium. In the early stages the glands were merely enlarged, but later they suppurated or became caseous. At the onset there were no lesions of the parenchyma of the lung, and even later not the ulcerating and caseous form, only a few scattered tubercles. He considered that it was in the spleen that the lesions passed from the lymph to the blood stream. When the spleen was normal no tubercles were found in the lungs, but when the former was invaded the latter were also affected.

Examples of this in children. *i.e.*, cases in which the spleen is the only abdominal viscus involved and the connection referred to between this and the pulmonary findings seem to find support in some of the instances in this series. One may be given: a male child, three years of age, showed miliary tubercles scattered through both lungs, the spleen contained similar tubercles, as did also the meninges. The hilus and paratracheal glands on the right side were enlarged to the size of a cobnut and were caseous. Again, as was pointed out above, in the peculiar limitation at times to the

lungs and meninges, if haematogenous metastasis occurs, the first part to suffer is the meninges. In two other instances, however, the lungs were affected with small tubercles (no focus) and the hilus and paratracheal glands were caseated, but the spleen was not involved; in one of these blood infection was apparent, since the meninges revealed basal tubercles.

On nine occasions were focal tubercles found in the brain or cerebellum. The commonest site was the latter, for cerebellar were found in eight. Of these, the focus was present in four cases in the left hemisphere, in three in the right, and once in both. In this last there were four distinct foci, two in each lateral lobe; two others had a second, extra cerebellar, focus, namely, in the right cerebral hemisphere in one, in the left crus in the other. Finally, one subject, a female child of two and a half years, exhibited multiple foci: three distinct ones in the left lobe of the cerebellum, two in the left cerebral hemisphere, and one in the left hippocampus.

A striking feature of the tuberculous conditions as met with here is the rarity of bone, joint or skin affections. In this series there were five with tuberculous ulcers of the skin, four of these on the face and neck and one on the forearm. Not a single instance of tuberculous joint disease was encountered, and only three with bone lesions. In two of these there were caries of the lower dorsal and upper lumber vertebrae; a third had caries of the sixth cervical vertebra, and tuberculous disease also of the left tibia and both femora. A fourth had widespread tuberculous disease—lungs, liver, spleen, peritoneum and meninges—and extensive caries of the left mastoid, but there was no absolute proof that this last was due to tubercle.

Tuberculous cervical adenitis, so frequently met with at home, is a comparative rarity in the post-mortem room here. Of the whole series there were only twenty-eight instances, and in three of these the enlargement was very slight, so slight that there was not sufficient macroscopical evidence to determine its nature; on section, however, giant cells and tubercle bacilli were seen.

In one case there was almost universal involvement of the glands—cervical, submaxillary, supraclavicular, axillary, mediastinal, mesenteric and femoral—together with widespread pulmonary, intestinal, and some renal tuberculosis. This was a child of only

three years. Sections did not show any of the usual conditions characteristic of Hodgkin's disease. In contrast to this, may be incidentally mentioned a little girl of seven months, showing but one cervical gland enlarged, with very extensive tuberculous disease—lungs, pleura, mediastinal glands, mesentery, intestines, liver, spleen, kidneys, meninges.

Cases in which the genito-urinary tract has been involved have been comparatively few in my experience here. The majority of these showed a few miliary tubercles as emboli in the glomerular capillaries, consituting part of a general haemic infection. There were ten instances in which the kidneys were found focally affected in conjunction with widespread tuberculosis. One, a girl of three years of age, merits further mention on account of the peculiar distribution. The extensive alimentary infection—tuberculous ulceration of both large and small intestines, caseated, adherent mesenteric glands, extensive infection of the peritoneum—and the equal distribution of tubercles throughout both lungs would point to the alimentary canal as the primary portal of entry. The condition of the kidneys, however, does not support the idea of a haematogenous origin from entrance of the bacilli into the general circulation from the lungs. Each kidney showed a large focus in a similar situation at the lower pole, the size of a cobnut and caseous, most advanced at the margin between the cortex and a pyramid, and passing in as if later it would discharge into the pelvis. No indication of involvement of the ureters was detected. The foci gave the impression that they had arisen from affection of the tubules in course of excretion (as mentioned by Aschoff and Israel). The foci were each of them in a more advanced state than a few smaller, pin-head and miliary, tubercles in the cortical area of the right kidney, which had more likely arisen by haematogenous infection. The kidney foci appeared to be of considerably older standing than the pulmonary condition, and showed more advanced caseation than the mediastinal glands, but less than the mesenteric. There were no indications of an ascending infection from lower down the urinary tract. Other viscera, liver and spleen, showed sparse tubercles only, and these were, in the former at all events, confined to the peritoneal surface. Briefly, the age of the kidney condition appeared to be less than that of the alimentary but

more than that of the pulmonary, and the mode of involvement is obscure.

Two others are of sufficient interest to warrant brief mention:— (i) An infant of nine months, showing generalised tuberculosis—lungs, intestines, liver, spleen, kidney—and, in addition to miliary infection of the last, one calyx in the left was hollowed out and lined by tuberculous material; (ii) a girl of four years, with miliary tuberculosis of the lungs and of the liver surface, but the only focus found in the body was a caseated mass occupying practically the whole of a pyramid in the left kidney.

Finally, while speaking on the subject of genito-urinary affection, mention must be made of two cases of exceptional interest. Both exhibited extensive disease, lungs, meninges, intestines, peritoneum and ovaries. In one, a girl of four years, both ovaries were enlarged, and had become converted practically into caseated masses; this case has been described in a previous paper when discussing the primary portal of entry. In the other, an infant of only eight months, the Fallopian tubes were swollen and caseous on both sides, while the ovaries were in a condition similar to the last. In this case a possible (or, rather, probable) source was by contiguity from the tuberculous peritoneum, but in the former the tubes did not appear to be affected.

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